

REMARKS

This is intended as a full and complete response to the Final Office Action dated April 5, 2006, having a shortened statutory period for response set to expire on July 5, 2006. Claims 1-6, 8-10, 12-16, and 19-26 remain pending in the application and are shown above. Claims 1-6, 8-10, 12-16, and 19-26 stand rejected by the Examiner. Please reconsider the claims pending in the application for reasons discussed below.

Claim Rejections - 35 USC § 112

Claims 21-22 and 23-26 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. Applicants respectfully traverse the rejection.

Applicants assert that the limitation of "wherein at the intermediate position the surface of the substrate is substantially parallel to the surface of the anode" in claims 21-22 is supported at least at paragraphs 11, 22, 27, 30-4, 42-46 and Figures 5-9. For example, the specification describes "the substrate may be tilted at an angle with respect to horizontal" (see, paragraph 22), "reducing the tilt angle to about horizontal when the contact ring initially touches the plating electrolyte" (see, paragraph 11), "the tilt angle of the substrate may be adjusted during the immersion process, thus generating a swing or pendulum type motion, which also urges bubbles attached to the substrate surface to be dislodged therefrom" (see, paragraph 22), the "tilt angle is generally between about 3° and about 30°" (see, paragraph 32), and "the components of plating cell 200 are tilted between about 3° and about 30°" (see, paragraph 27).

Accordingly, the specification supports tilting a substrate being held by a receiving member to a first tilt angle and reduce to a second tilt angle (e.g., about horizontal), and adjusting the tilt angle in a swing or pendulum type motion inside a plating cell, where the components of the plating cell are tilted. In the swing/pendulum type motion, there is an intermediate position between the first tilt angle and the second tilt angle as illustrated and supported in Figures 5 and 6, where the surface of the substrate is substantially parallel to the surface of the anode (see, Figure 5) and the tilt angle of the substrate can also be adjusted to a horizontal position (see, Figure 6). Furthermore, the specification describes that "head assembly 300 may be tilted back and forth between a first tilt angle and a second tilt angle in an oscillatory manner, i.e.,

in a manner where the substrate is tilted between a first angle and a second angle several times". Thus, the specification and the drawings support that the substrate is tilted back and forth from a first tilt angle through an intermediate position to a second tilt angle and one example is shown in Figure 5.

Applicants also assert that the limitation of "a third tilt angle" in claims 23-26 is supported at least at paragraphs 11, 22, 27, 30-40, 42-46, and Figures 5-9. For example, the specification describes "tilting the contact ring to a tilt angle,.....reducing the tilt angle to about horizontal when the contact ring initially touches the plating electrolyte, and positioning the substrate in a processing position" (see, paragraph 11), the "processing position generally includes positioning the substrate such that the substrate surface is parallel to an upper surface of the anode positioned within the plating cell" (see, paragraph 46), and "the components of plating cell 200 are tilted between about 3° and about 30°" (see, paragraph 27).

According, the specification and the drawings support that a substrate being held by a receiving member is tilted to a first tilt angle, a second tilt angle (e.g., about horizontal), and a third tilt angle (e.g., a processing position parallel to the anode), such that a plating surface of the substrate is positioned substantially parallel to the surface of the anode.

Withdrawal of the rejection is respectfully requested.

Claim Rejections - 35 USC § 103

Claims 1-4, 8-9, 12-16 and 20-26 stand rejected under 35 USC § 103(a) as being obvious over *Dordi et al.* (US Patent No. 6,582,578) in view of *Sendai et al.* (US Patent Application No. 2003/0057098). Applicant respectfully traverses the rejection.

Dordi et al. discloses an electro-chemical plating system and a plating method. The method of *Dordi et al.* includes immersing the substrate by vertically displacing the substrate into an electrolyte solution while maintaining the substrate at a tilt angle above the electrolyte solution and positioning the substrate substantially horizontal prior to plating a material on the substrate.

Sendai et al. discloses an electro-chemical plating system having a tilt mechanism and a head portion for holding a substrate, and a method of immersing the wafer (W) into a plating bath 12 having an anode 17. *Sendai et al.* discloses that, when

the anode 17 is placed horizontally, the wafer (W) is held at a first inclined angle of α and then a horizontal processing position. (See, Figures 1-9, paragraphs 0022-0025, and 0080-0087.) *Sendai et al.* further discloses that the wafer (W) is held at a fixed angle of β for immersing and processing when the anode 17 is inclined at the same fixed angle of β . *Sendai et al.* discloses the wafer does not need to be brought back to horizontal since the wafer and the anode 17 are tilted at the same inclined angle of β during both immersion and plating processes. (See, Figures 11-12 and paragraphs 0091-0096.)

Thus, *Dordi et al.* in view of *Sendai et al.* discloses that the substrate is held at a first tilt angle and a horizontal processing position in a horizontal plating cell, or alternatively, the substrate is held at a fixed tilt angle in a plating cell with a tilted anode for immersion and processing without the need to change the angle of the substrate.

Applicants respectfully submit that there is no teaching, suggestion, or motivation in the references for the substrate to be held at three angled positions. *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show, or suggest tilting a receiving member and positioning a substrate to a first tilt angle, a second tilt angle, and a processing angle, as recited in claims 1, 8, 15, 23, and claims dependent thereon.

Accordingly, *Dordi et al.* in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a fluid solution having an anode placed therein, including loading a substrate into a receiving member, tilting the receiving member to a first tilt angle, displacing the receiving member toward the fluid solution at the first tilt angle, tilting the receiving member to a second tilt angle different from the first tilt angle, positioning the substrate at a processing angle such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the fluid solution, wherein the anode is tilted between about 3° and about 30° , as recited in claim 1 and claims dependent thereon.

Dordi et al. in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for minimizing bubble adherence to a substrate during a substrate immersion process, including tilting the substrate to a tilt angle measured from horizontal, vertically actuating the substrate toward a fluid solution having an anode placed therein while maintaining the tilt angle, reducing the tilt angle to about horizontal once the substrate contacts the fluid solution, while continuing the vertical actuation of

the substrate, and positioning the substrate at a processing angle such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the fluid solution, wherein the anode is tilted between about 3° and about 30°, as recited in claim 8 and claims dependent thereon.

Dordi et al. in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a plating electrolyte having an anode placed therein, including positioning the substrate on a contact ring, securing the substrate to the contact ring with a thrust plate assembly, tilting the contact ring to a tilt angle of between about 3° and about 7°, vertically actuating the contact ring toward the plating electrolyte while maintaining the tilt angle, rotating the contact ring at a rotation rate of between about 30 rpm and about 120 rpm, reducing the tilt angle to about horizontal when the contact ring initially touches the plating electrolyte, and positioning the substrate in a processing position such that a plating surface of the substrate is positioned substantially parallel to a surface of the anode placed in the plating electrolyte, wherein the anode is tilted between about 3° and about 30°, as recited in claim 15 and claims dependent thereon.

Dordi et al. in view of *Sendai et al.*, alone or in combination, does not teach, show or suggest a method for immersing a substrate into a plating solution contained in a plating cell of a plating apparatus, the plating cell having an anode placed therein, including loading a substrate into a receiving member of the plating apparatus, tilting the receiving member to a first tilt angle relative to a surface of the anode, immersing the substrate into the plating solution of the plating cell, pivoting the receiving member from the first tilt angle through an intermediate position to a second tilt angle while maintaining the substrate immersed in the plating solution, wherein at the intermediate position the surface of the substrate is substantially parallel to the surface of the anode, and tilting the substrate being held by the receiving member from the second tilt angle into a third tilt angle such that a plating surface of the substrate is positioned substantially parallel to the surface of the anode, as recited in claim 23 and claims dependent thereon.

Withdrawal of the rejection is respectfully requested.

Claims 5, 6, 10 and 19 stand rejected under 35 USC § 103(a) as being obvious over *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.* (US Patent Application No. 2002/0084189). Applicant respectfully traverses the rejection.

Dordi et al. and *Sendai et al.* have been discussed above.

Wang et al. discloses an electro-chemical plating system and a plating method. *Wang et al.* does not disclose tilting a receiving member and positioning a substrate to a first tilt angle, a second tilt angle, and a processing angle, as recited in claims 1, 8, 15, which claims 5, 6, 10, and 19 are dependent on, and lacking in *Dordi et al.* in view of *Sendai et al.* Therefore, *Dordi et al.* in view of *Sendai et al.*, and further in view of *Wang et al.*, alone or in combination, does not teach, show, or suggest the subject matter, as recited in claim 5, 6, 10, and 19. Withdrawal of the rejection is respectfully requested.

In conclusion, the references cited by the Examiner, alone or in combination, do not teach, show, or suggest the invention as claimed.

Having addressed all issues set out in the office action, Applicant respectfully submits that the claims are in condition for allowance and respectfully request that the claims be allowed.

Respectfully submitted,



Keith M. Tackett
Registration No. 32,008
PATTERSON & SHERIDAN, L.L.P.
3040 Post Oak Blvd. Suite 1500
Houston, TX 77056
Telephone: (713) 623-4844
Facsimile: (713) 623-4846
Attorney for Applicant(s)